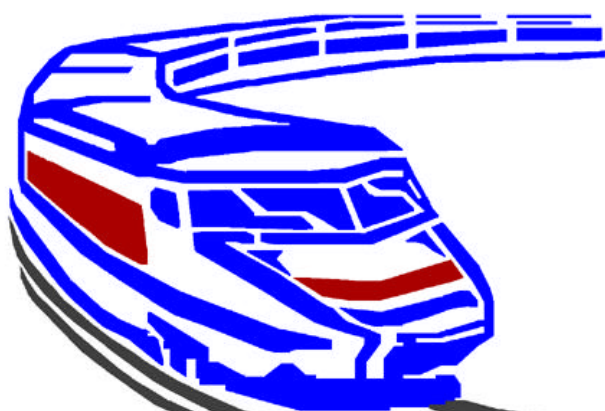




Bristol Rail Passenger Study

Phase 2

Final Report



July 1998



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PROJECT DESCRIPTION

In 1994, the Virginia Department of Rail and Public Transportation (VDRPT) initiated a study of the feasibility of instituting passenger rail service between Bristol and both Richmond and Washington, DC. The proposed service uses the existing Norfolk Southern (NS) tracks through Lynchburg where service branches between the two proposed termini. The initial study, completed in early 1996, indicated that it is feasible to operate two round trips per day utilizing modern tilting trains equipped with steerable wheelsets. Necessary capital investments were identified, including station upgrades, storage and maintenance facilities, and a connection between NS and CSX tracks in Richmond.

Ridership and revenues were projected to be strong and to grow steadily as the population and economy of the region continued to expand. An operating deficit was projected during the initial years of operations, but by the seventh year of operation ridership and revenue were projected to have increased sufficiently to generate enough revenues to cover annual operating expenses. Several issues were identified in the first phase that require additional analysis, and it was recommended that a second phase be initiated to address these issues.

This second phase of the project was initiated to analyze in greater detail the issues raised in the initial study, with the most important task being to establish the ability of proposed passenger service to operate without impeding existing and proposed freight service. A detailed computer model of both freight and passenger operations was used to develop a more precise timetable of passenger operations. The timetable was then used to refine the anticipated ridership and revenue. Track improvement alternatives were explored to determine any upgrades that would be required to minimize or eliminate conflicts with freight service. Alternative train technologies were investigated to identify the most suitable technology for use on the proposed service. A close inspection of potential station stops revealed the extent to which renovations would be required at the proposed new and existing train stations. Finally, a complete financial analysis was conducted to identify the capital costs, operating and maintenance costs, and revenues necessary to operate the proposed service.

PHASE 2 FINDINGS AND RECOMMENDATIONS

Proposed Service

It is recommended that passenger rail service be implemented to connect Bristol with both Richmond and Washington, D.C. All stations would be served by two round trips per day. Trains leaving Bristol would travel through the New River Valley and Roanoke to Lynchburg where the line would split, with one train continuing north to Charlottesville and on to Alexandria and Washington, D.C., while the other line goes east through Farmville to Richmond. These trains would operate on existing tracks owned by Norfolk Southern Corporation, with the exception of the CSX, Conrail and Amtrak owned tracks that provide access from Alexandria to Washington Union Station, and a short segment of CSX track which accesses Richmond's Main Street Station.

Station Stops

A total of 19 stations would be served. Eight of these stations are currently served by Amtrak passenger trains. The remainder are not currently served, but all except for Wytheville and Radford have a historic passenger station which can be used for the Bristol service. Seven stations would be staffed with personnel who would sell tickets and provide other services; the other stations would be unmanned.

Table 1 - Station Locations

Manned Stations	Unmanned Stations	
Bristol	Abingdon	Bedford
Roanoke	Marion	Appomattox
<i>Lynchburg</i>	Wytheville	Farmville
<i>Richmond</i>	Pulaski	Orange
<i>Charlottesville</i>	Radford	<i>Culpeper</i>
<i>Alexandria</i>	Christiansburg	<i>Manassas</i>
<i>Washington, D.C.</i>		

Stations in Italics are currently served by Amtrak

Travel Time

The projected Travel time from Bristol to Washington, D.C. is 7 hours and 27 minutes. The travel time from Bristol to Richmond is 6 hours and 47 minutes.

Trainsets

Modern trainsets will be used that incorporate tilting and steerable wheel technologies to allow trains to maintain higher speeds through curves. The interiors must be designed to be comfortable and attractive for passengers, and will include such amenities as conference seating, enclosed luggage racks, plugs for computers and other electronic devices, and quality food services.

It is recommended that the trains be procured through a lease arrangement with the costs spread out as an operational expense over 15 years. The estimated annual lease expense is \$2.92 million.

Both locomotive hauled and self-propelled trainsets were analyzed for their applicability to the Bristol Service. Self-propelled trains offer advantages in their lower operating and maintenance costs and their flexibility in changing the number of cars in a train to accommodate demand. However, this type of equipment is not currently produced in the United States. Trains of this type that are currently built in Europe and Japan do not currently meet U.S. federal equipment standards, but manufacturers claim they can redesign their equipment to be in full compliance. Locomotive hauled trains utilize proven, readily available equipment. However, this type of train will be more expensive to operate, particularly when used for the short consists (4 passenger cars) recommended for this service. Self-propelled trainsets appear to have some advantages for the Bristol service, if they become available in this country, but either type of equipment would meet the service requirements.

Capital Costs

Capital Improvements will be needed in order to allow the proposed passenger trains to operate efficiently on the existing rail network. Improvements fall into two general categories, those that are needed to minimize conflicts between freight and passenger trains (new and extended sidings), and those that are needed specifically for the passenger operations (Richmond connection, storage facilities and station improvements). The recommended improvements include:

Table 2 - Capital Costs

Type of Improvement	Cost
TRACK AND SIGNAL IMPROVEMENTS: Three Siding Extensions and One New Siding Richmond Connection	\$4,281,000 <u>\$3,600,000</u>
TOTAL	\$7,881,000
STORAGE FACILITIES Bristol, Lynchburg and Lynchburg	\$353,000
STATION IMPROVEMENTS Improvements to 9 Unmanned Stations	\$1,105,000
TOTAL CAPITAL COSTS	\$9,339,000

Ridership, Revenue and Expenses

Projections of revenues and expenses are made using current year dollars. Three different fare levels, ranging from \$0.17 to \$0.30 per mile were tested to determine their impact on ridership and revenues. The recommended fare level is \$0.22 per mile, which equates to \$71 for a one-way fare for the longest trip on the system, from Bristol to Washington, D.C.

Table 3 - Ridership, Revenues and Expenses (1996 Dollars)

	2000	2005	2010	2020
Ridership	372,100	476,000	582,500	782,100
Revenues	\$13,871,000	\$18,626,000	\$23,417,900	\$32,203,600
Operating Expenses	\$24,694,846	\$24,770,312	\$24,846,355	\$24,985,784
Difference	(\$10,823,846)	(\$6,144,312)	(\$1,428,455)	\$7,217,816

Operating Expense figures include annual lease payments for rolling stock at \$2.92 million per year.

There would not be sufficient revenues generated during the first several years of operation to fully cover the operating expenses. Thus, a subsidy of operations will be required. It is projected that ridership will grow steadily and that within twelve years revenues will grow to the point where a subsidy is no longer required.

Railroad Concerns

Nearly all of the track on which the proposed Bristol Passenger Rail Service would operate is owned by Norfolk Southern Corporation. These tracks are used primarily for the movement of freight, and Norfolk Southern is concerned about the impact of the proposed passenger service on their current and future freight traffic. The railroad has stated that the following conditions must be met before passenger trains are permitted to operate on their tracks:

- Passenger trains must not cause any delay to freight trains;
- Norfolk Southern must be fully protected from all liability arising out of passenger train operations; and
- Norfolk Southern expects passenger trains to contribute a level of compensation and profitability similar to freight trains.

It is the intent of the Commonwealth to meet these conditions through the recommendations presented here. Norfolk Southern Corporation has expressed some concerns with the recommendations of this study. A copy of a letter from Mr. Bill Schafer, Director of Strategic Planning for Norfolk Southern, addressing these issues is included in Appendix A. An agreement must be reached between the Commonwealth and Norfolk Southern before the proposed passenger rail service can be implemented.

INFRASTRUCTURE

Track

With the exception of short sections of track entering Richmond and Washington, DC which are owned by CSX, the entire proposed passenger service would operate on track owned by Norfolk Southern Corporation (NS). The existing network is comprised of both single and double track lines. The route between Washington and Lynchburg, which was once entirely double track, is now single track with some long sections of double track. The NS track between Bristol and Lynchburg is also single track with passing sidings except for the heavy traffic dual mainline section between Walton and Roanoke. Similarly, the route between Lynchburg and Richmond is single track with sidings. Between Pamplin City and Burkeville, however, NS operates two single track lines. The northern of the two passes through Farmville and carries a lower volume of traffic. The southern line bypasses Farmville to connect with the higher density ex-Virginian Railway line from Roanoke to Crewe via Altavista, which conveys most of NS's large export coal business. The two sections are often operated as a one-way pair with the northern line carrying westbound traffic, and the southern line the eastbound traffic. Figure S-1 shows the rail lines that would be used for this service.

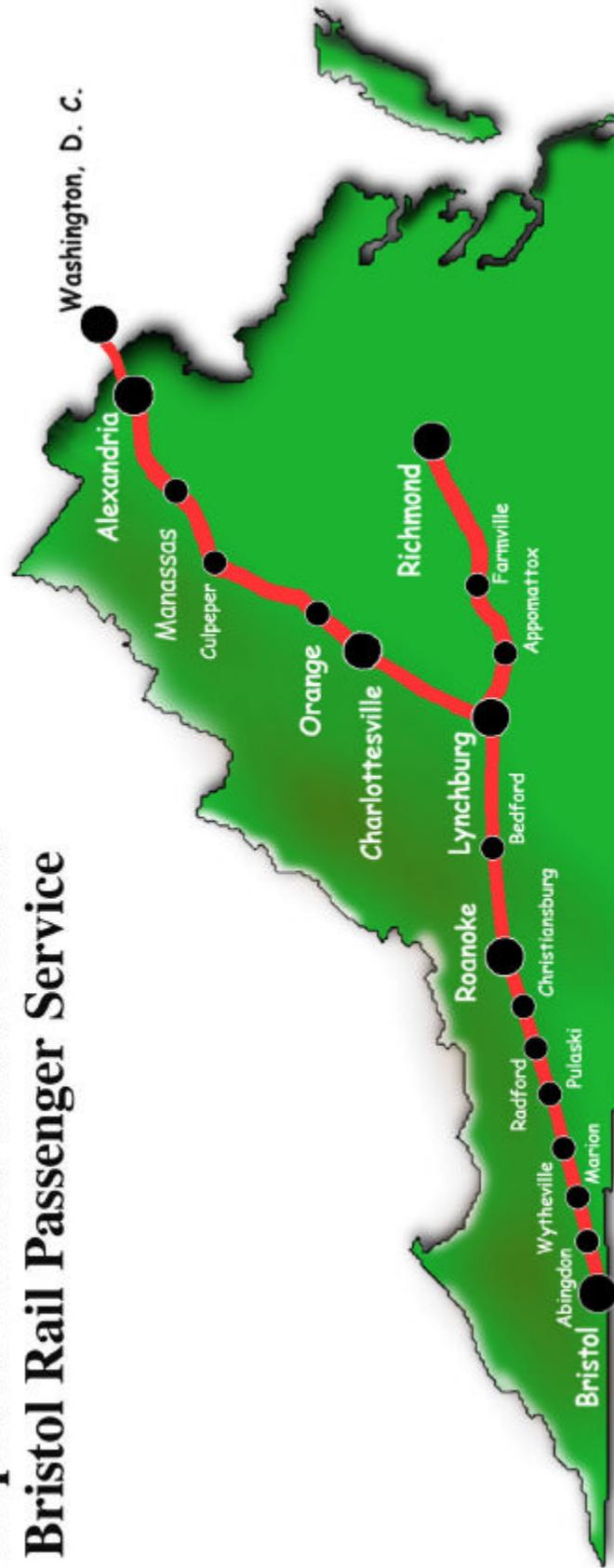
Track Improvements

Some track improvements will be required to minimize the impacts that the proposed passenger service will have on existing freight and passenger service. These improvements can best be categorized into essential improvements necessary to permit the proposed passenger service, and improvements to increase the capacity of the existing track network so as to reduce the potential for conflicts between existing and proposed service.

Table 4 - Recommended Track Improvements

IMPROVEMENT	DESCRIPTION
Essential improvements to facilitate passenger service	Connection between eastbound, Norfolk Southern track on the south side of the James River to CSX track running north into Main Street Station
	Spur track at the Lynchburg Station to allow storage of a proposed extra train set.
Track improvements for increased network capacity	0.4-mile Extension of Abingdon siding
	0.1-mile extension of Glade Spring siding
	0.1-extension of Marion siding
	1.4-mile construction of siding in the vicinity of Rural Retreat

Figure 1
Proposed Routes and Stations
Bristol Rail Passenger Service



Stations

Currently, passenger trains serve stations in Alexandria, Manassas, Culpeper, Charlottesville, and Lynchburg. Amtrak and VRE operate out of Union Station in Washington, DC, a major passenger rail terminal on the Northeast Corridor. Amtrak operates passenger service out of the Staples Mill Road Station in Richmond on the CSX Richmond-Washington line. Work is currently under way to renovate the Main Street station in downtown Richmond. That building is currently occupied by state government agencies. Similarly, the Cities of Lynchburg and Charlottesville have undertaken a study of improvements to the their stations that would better serve Amtrak passengers and benefit passengers of the proposed Bristol service. The cities of Roanoke and Bristol have a desire to renovate not only the train stations in those cities but also the surrounding downtown areas to create an economically viable center and area attractive to tourists and other visitors.

In the proposed locations for new stops, many of the former passenger rail stations are still standing but have been put to other uses. This study investigated the needs to make these sites functional for proposed passenger service. The locations identified for use are Abingdon, Marion, Wytheville, Pulaski, Radford, Christiansburg, Bedford, Appomattox and Farmville. It is recommended that all of these stations be unmanned. They will have adequate facilities for passengers to park and wait for the train, but they will not be designed to require or accommodate a ticket agent or station manager. All of these unmanned station sites will require renovations, in varying degrees. In general, each site has space, adjacent to a tangent section of track, sufficient for:

- a station building;
- a platform;
- parking, passenger drop-off and vehicular circulation; and
- roadway connections to adjacent street network.

All of the unmanned station sites, except Wytheville, have standing structures that have been adapted for alternative uses. A cooperative effort between the proposed rail service, the current building owners, and the building occupants will be needed to make use of those facilities.

Several of the communities that have been identified as stops on the proposed Bristol rail service are currently Amtrak stations. These include:

Table 5 - Passenger Stations

Manned Stations		Unmanned Stations	
<i>Charlottesville</i>	Bristol	Abingdon	Bedford
<i>Alexandria</i>	Roanoke	Marion	Appomattox
<i>Washington, D.C.</i>		Wytheville	Farmville
<i>Lynchburg</i>		Pulaski	Orange
<i>Richmond</i>		Radford	<i>Culpeper</i>
		Christiansburg	<i>Manassas</i>

Stations in Italics currently served by Amtrak

SERVICE

While freight service varies from day to day, Norfolk Southern submitted a schedule for operations during the week of October 13-19, 1996 as typical of their current service. Norfolk Southern ran over 350 inter-city freight trains on the study corridor during that “typical” week. Prior to the proposed acquisition of Conrail, NS did not envision significant changes in freight service in the future. The proposed acquisition has changed that forecast. Consequently, this study evaluated both existing and anticipated changes to service as a back drop for proposed passenger service.

The proposed passenger service was developed from the Phase 1 schedule with modification to accommodate the operating characteristics of the proposed rolling stock, appropriate dwell times at stations, and timing to minimize impacts to freight and other passenger service.

Table 6 - Typical Train Schedule

Northbound				
Bristol	7:10a		3:00p	
Roanoke	10:07a		6:02p	
AR Lynchburg	11:08a		6:58p	
LV Lynchburg	11:33a		7:15p	
Charlottesville	12:27p		8:20p	
Manassas	1:51p		9:43p	
Washington, D.C.	1:57p		10:29p	
LV Lynchburg		11:23a		7:28p
Farmville		12:32p		8:27p
Richmond		1:57p		9:52p
Southbound				
Washington, D.C.	7:10a		3:00p	
Manassas	7:55a		3:45p	
Charlottesville	9:20a		5:10p	
AR Lynchburg	10:26a		6:15p	
Richmond		7:45a		3:30p
Farmville		9:38a		5:23p
AR Lynchburg		10:10a		5:55p
LV Lynchburg	10:45a		6:35p	
Roanoke	11:41a		7:34p	
Bristol	2:54p		10:37p	

RAIL OPERATIONS MODELING

Current and future rail operations were modeled using the *Dispatch Planning Model (DPM)*. DPM works with a data set of train origins, destinations, and intermediate stops, and train consists to produce a simulation of the train movements in the modeled network. The model resolves train meets and passing conflicts in accordance with the priorities assigned to the modeled trains. The scenarios modeled include:

- Existing Conditions - The initial simulation used the original (current as of 9/96) Norfolk Southern, Amtrak, and Virginia Rail Express schedules on current track configuration.
- Future Operations with “No” Improvements - The scenario for original (9/96) freight and passenger operations with addition of twice daily Bristol Rail service on existing track configuration. Only the minimal improvements beyond the existing track network of a new pocket track at Lynchburg and connection track at Richmond are assumed.
- Future Operations with Minimal Improvements - The scenario of for original (9/96) freight and passenger operations with the addition of twice daily Bristol Rail service on existing track configuration with moderate improvements (addition of new pocket track at Lynchburg, connection track at Richmond, and extension of sidings at Marion, Glade Spring, and Abingdon by 0.1, 0.1, and 0.4 miles respectively).
- Future Operations with Full Improvements - The scenario of current freight and passenger operations with addition of twice daily Bristol Rail service on existing track configuration with improvements to reduce delay to freight operations to current levels. Improvements would include the addition of new pocket track at Lynchburg, connection track at Richmond, extension of sidings at Marion, Glade Spring, and Abingdon by 0.1, 0.1, and 0.4 miles respectively, and building of a 1.4 mile sidings at Rural Retreat.

After this initial testing was completed, Norfolk Southern presented to VDRPT and the Surface Transportation Board its operating plan subsequent to the proposed acquisition of portions of the Conrail system. This resulted in a new set of “existing” and future conditions as follows:

- Existing operations with Norfolk Southern-constructed improvements - (new track, mid-1997 level of freight service).
- Existing operations plus Bristol Service with Norfolk Southern-constructed improvements - (new track, with mid-1997 level of freight service and proposed passenger service).
- Future expanded operations with Norfolk Southern-constructed improvements - (new track and expanded freight service post-Conrail acquisition).
- Future expanded operations, Norfolk Southern-constructed improvements, and proposed Bristol Rail service - (new track and expanded freight service post Conrail acquisition, and proposed passenger service).

A comparison of two scenarios, one with and one without Bristol Rail service, is shown in the table below.

**Table 7 - Comparison of DPM Simulation Runs
With and Without Bristol Rail Service**

Track Configuration	NS Improved	NS Improved	
VA Improvements	None	None	Change with addition of Bristol Rail
Train Schedule	Post Conrail	Post Conrail	passenger service
Bristol Rail Service Included?	No	Yes	
Dwell (minutes) for:			
VRE (+ BRE)	445	990	545
Amtrak	215	208	(7)
Triple Crown	0	0	0
Intermodal	116	116	0
Through Freight	133	133	0
Loaded Coal	90	90	0
Empty Coal	40	40	0
Loaded Grain	30	30	0
Other	543	544	1
Total	1,612	2,151	539
Delay (minutes) to:			
VRE (+ BRE)	4	30	26
Amtrak	38	47	9
Triple Crown	46	73	27
Intermodal	136	429	293
Through Freight	318	453	135
Loaded Coal	59	66	7
Empty Coal	256	370	114
Loaded Grain	0	0	0
Other	5	10	5
Total	862	1,478	616
Run Time (minutes) for:			
VRE (+ BRE)	1,649	3,836	2,187
Amtrak	1,509	1,511	2
Triple Crown	981	982	1
Intermodal	4,042	4,077	35
Through Freight	3,972	4,002	30
Loaded Coal	482	482	0
Empty Coal	1,876	1,868	(8)
Loaded Grain	80	80	0
Other	329	331	2
Total	14,920	17,169	2,249
Elapsed Time (minutes) for:			
VRE (+ BRE)	2,098	4,856	2,758
Amtrak	1,762	1,766	4
Triple Crown	1,027	1,055	28
Intermodal	4,294	4,622	328
Through Freight	4,423	4,588	165
Loaded Coal	631	638	7
Empty Coal	2,172	2,278	106
Loaded Grain	110	110	0
Other	877	885	8
Total	17,394	20,798	3,404

DPM produces a series of performance measures that assist in evaluating the results of each simulation. The most important measure is that of feasibility. DPM evaluates three-day segments and determines if all trains can be dispatched as planned. Two feasibility assessments, therefore, were made for each scenario—a Wednesday assessment which includes the period of Tuesday, Wednesday, and Thursday, and a full week assessment. The other performance measures are:

- The total operating time for three days of freight service. This analysis does not reflect any delays to Bristol service. The measure is useful for Norfolk Southern because it permits a direct comparison of today's operations with those of the future.
- The delay for the entire rail network and a sub-division of that delay between passenger (Amtrak, VRE, and proposed Bristol Rail) service and Norfolk Southern freight service. Generally, delay is caused by trains waiting on sidings while other trains with higher priority pass on the mainline. The delay for the total system is also expressed as a percentage of total run time.
- The fuel consumption for the total system, further sub-divided between passenger service and freight service.

The results of the DPM modeling indicate that Bristol passenger service would not inhibit freight service as it currently operates in the subject corridors. Acknowledging the limited precision of any modeling effort and the routine variations in railroad operations, passenger and freight service could coexist at the levels envisioned. The following table summarizes the results of this modeling effort.

Table 8 - Summary of Modeling Results

Feasible		Total Run Time for Freight (min)	Delay Time (min)			% of run time	Fuel Consumption (gal)			% change over existing
Wed.	Weekly		Total	Bristol Service	Freight		Total	Bristol Service	Freight	
Existing Conditions										
Yes	Yes	16,030	790	NA	790	4.90	48,230	NA	48,230	0.00
Future Operations with “No” Improvements										
Yes	No	16,969	1,560	171	1,389	8.20	49,384	848	48,536	0.60
Future Operations with Minimal Improvements										
Yes	Yes	16,876	1,464	171	1,293	7.70	49,359	848	48,511	0.58
Future Operations with Full Improvements										
Yes	Yes	16,748	1,339	171	1,168	7.00	49,301	848	48,453	0.12
Existing Operations plus Bristol Service with Norfolk Southern-constructed Improvements										
Yes	Yes	15,903	1,322	171	1,151	7.23	49,069	844	48,225	(0.01)
Future Expanded Operations with Norfolk Southern-constructed Improvements										
Yes	Yes	16,115	1,353	186	1,167	7.24	49,531	844	48,687	0.95
Future Expanded Operations (post Conrail) with Norfolk Southern-constructed Improvements										
Yes	Yes	17,167	1,456	186	1,270	7.40	52,692	844	51,848	7.50

It is also important to note that this operations modeling effort was based upon the original (9/96) Norfolk Southern, Amtrak, and VRE schedules which were developed around the existing track configuration. Additions to the track network, particularly in the “full improvements” scenario, could offer opportunities to optimize freight and passenger service such that today’s operating parameters could be met. The additional sidings could also permit greater flexibility in freight operations and permit the system to better recover from random events that can have a “domino effect;” a minor incident can cause localized delays that ultimately extend across the system.

RIDERSHIP

Ridership was forecast for the proposed Bristol service using information on current year travel in Virginia and forecasts of change in demographics and economics in the future. The ridership forecasting for this phase of the project expanded upon the procedures used in Phase 1 and produced a refined, more accurate and detailed estimate of future ridership. Traveler preference surveys conducted in Phase 1 were supplemented with additional surveys in this phase. A total of 2,044 surveys were performed, almost double the number performed in Phase 1. The zone system was modified with more zones covering smaller land areas and the survey results were coded into the more detailed zone system. The combination of finer zones and a larger survey population increased the precision of the survey results and accuracy of the modeling effort.

The Phase 1 study recommended the X2000 TVA trains which were envisioned to offer higher speeds on the relatively low design speed tracks within the study corridor. Operating speeds, including dwell times at stations and other operational changes to accommodate both passenger and freight service already running in the corridor, were expected to be higher than were determined in this phase. As a consequence, the trip times between stations increased from those reported in Phase 1 resulting in a decrease in the attractiveness of rail service over other modes.

To test the impact of fare levels on ridership and operating revenues, three different fares were used to represent the range of potential rates. The \$0.17 per mile fare used in the first phase was tested again. A fare of \$0.30 per mile used as a high scenario, and a rate of \$0.22 per mile was used as an average between these two extremes. Based on this analysis, the fare of \$0.22 per mile is being recommended for the proposed Bristol Rail Service. The following table summarizes the ridership, revenue, and timetables for Phase 1 and Phase 2. The estimated one way fare shown is for the longest trip on the study corridor, Bristol to Washington, DC, a distance of 325 miles. Actual fares paid will vary according to length of trip, and some discounting for advance booking could be provided. Many of the trips taken will continue beyond Washington, DC, with passengers transferring to Amtrak’s Northeast Corridor Service. Only the revenue attributable to the portion of the trip taken in Virginia has been utilized to develop these revenue projections.

Table 9 - Summary of Ridership, Revenues, and Timetables

	PHASE 1 FORECAST (\$0.17/MILE FARE)	PHASE 1 SCENARIO 5 (\$0.17/MILE AND CONVENTIONAL ROLLING STOCK)	PHASE 2 (\$0.17/Mi.)	PHASE 2 (\$0.22/Mi.)	PHASE 2 (\$0.30/Mi.)
Incremental Ridership	640,000 (Year 2002)	510,000 (Year 2002)	390,300 (Year 2000)	372,100 (Year 2000)	345,900 (Year 2000)
Revenues (millions of \$s/year)	21.42	17.73	10.23	12.61	16.08
Est. One Way Fare Bristol - Washington	\$55	\$55	\$55	\$71	\$97
Average Trip Length (miles)	196.5	204.5	163.0	161.0	159.4
Average Trip Time:					
Lynchburg-Bristol	3:54	4:46	4:13	4:13	4:13
Lynchburg-Richmond	2:10	2:59	2:24	2:24	2:24
Lynchburg-Washington	2:36	3:18	3:16	3:16	3:16

VEHICLE TECHNOLOGY

The rolling stock technology assessment examined a variety of alternative technologies, focusing on specific manufacturers as representative of the possibilities within each alternative. All of the equipment analyzed incorporates tilting and steerable wheel technology, which are essential to maximize speeds on the existing track network. The following table summarizes the criteria and the alternatives considered.

Pending completion of more detailed performance simulations or studies by rolling stock equipment suppliers, our preliminary conclusions are that Diesel Multiple Unit (DMU) equipment is best suited for the Bristol service. However, this vehicle is not currently available in fully U.S. compliant form and given the small number of cars required, acquisition at reasonable cost will be dependent on other U.S. procurements.

New locomotives and conventional passenger cars on the other hand are readily available in fully compliant U.S. form and at competitive prices. Delivery schedules are estimated to be 12 to 18 months. While operating and maintenance costs of short locomotive-hauled trains may be higher than DMU's, the long history and experience with locomotives and cars offer certain advantages such as high reliability and availability. These factors can not be ignored in the final evaluation and selection process.

Regardless of the technology selected, it is recommended that field tests be conducted to determine the suitability of the proposed equipment for operation on the existing track network.

Table 10 - Rolling Stock Technology Assessment Summary

ITEM/ISSUE	TECHNOLOGY									
	Self-Propelled (DMU)			Locomotive-Hauled						
				Cars				Locomotive		
	IC3	VT 610/628	Alstom TER	Single Level ³	NEC American Flyer	X2000 Cars	Talgo	GM DE30-AC	GE Genesis	Turbine Power
Manufacturer	ADTranz	Siemens	GEC Alstom	Bombardier/ Nippon Sharyo	Bombardier	ADTranz	Talgo	EMD	General Electric	Turbomeca Allied signal
Origin/Current Operation	Denmark, Sweden, Israel, Spain	Germany	France	Amtrak, New Jersey, Montreal, Baltimore	Amtrak NEC	Sweden State Railways	Spain/ State of Washington/ Amtrak	Long Island Railroad	Amtrak	Amtrak
U.S. Standards Compliance	no	no	no	yes	yes	no	no	yes	yes	yes
ADA Compliance	no	no	no	yes	yes	no	no	N/A	N/A	N/A
Passenger Capacity ^{1,2}	290	280	280	290	290	280	300/10 cars	N/A	N/A	N/A
Tilting Suspension	no/option	yes	no	no	yes	yes	yes	no	no	no
Maximum Speed (mph)	115	90	80	125	150	150	125	110	110	125
Compatibility with U.S. Equipment	no	no	no	yes	yes	no	no	yes	yes	yes
Estimated Price	\$7.0M/4cars	\$6.9M/4 cars	\$6.7M/4cars	\$6.4M/4cars	\$8.8M/4 cars	\$9.4M/4 cars	\$7.5M/10 cars	\$2.4M	\$2.6M	\$5M
Estimated Delivery Schedule	2.5 years	3 years	3-4 years	18 months	4 years	3 years	2 years	18 months	18 months	3.5 years
Experience in the U.S.	no	no	no	yes	not yet	no	yes	not yet	yes	yes
Steerable axes	no/option	no/option	no/option	no/option	yes	yes	no	no/option	no/option	no
Traction Power (HP)	1,600	1,300	850	NA	NA	NA	NA	3,000	2,700	4,000

NOTES: ¹ Includes food service equipment and services

² Assume 300-passenger train requirement

³ Single level generic car. Candidates are *a)* Comet Bombardier and *b)* MARC - Nippon Sharyo



"Alice" - Diesel Multiple Unit (DMU) from Bombardier

**"Flexliner" DMU
from Adtrans**



**59PH Locomotive from
Electro-Motive Division (EMD) of
General Motors**

COSTS

The capital costs of the proposed Bristol Rail service include four principal categories: (1) track and signaling improvements (including the proposed connection track at Richmond), (2) yards, maintenance, and storage facilities improvements, (3) station improvements (for the unmanned stations), and (4) rolling stock acquisition. This last category, was converted to an operating and maintenance cost by using a leasing arrangement to procure rolling stock and therefore is not included as a capital cost. Each element within these groups was studied in detail to estimate the capital costs that will be required to initiate the proposed service.

Table 11 - Capital Costs (1996 Dollars)

CAPITAL ITEM	COST ESTIMATE
Siding improvements	\$4,281,000
James River Crossing Connection	\$3,600,000
Yards, maintenance, and storage facilities	\$ 353,000
Unmanned stations	\$1,105,000
Total capital costs	\$9,339,000

Operating and maintenance costs were identified for major expense categories. The operating and maintenance costs for the proposed Bristol service were initially estimated in Phase 1 of this project. The various costs were assembled from: experience with Virginia Railway Express (VRE) operations in northern Virginia; commuter rail and inter-city rail operations in other locales; and data from Amtrak operations other than those on the Northeast Corridor. Those costs have been refined and are presented in the following section. The opening year operating and maintenance costs and the expense categories are shown in the table below.

Table 12 - Opening Year Annual Maintenance and Operating Costs (1996 Dollars)

EXPENSE CATEGORY	ANNUAL COST
Operations	4,628,160
Station and Passenger Information	1,157,040
Equipment Maintenance	4,650,000
Energy	920,799
Insurance	1,002,000
Sales and Marketing	208,065
Purchased Services	1,400,000
Leases (excluding right of way rights)	325,000
Equipment leases	2,920,000
Right of Way Access	5,502,000
General and Administrative Support	1,317,358
TOTAL	24,030,422

FINANCIAL ANALYSIS

The financial viability of the proposed passenger service was analyzed to determine:

- the initial outlay of funds that would be required to initiate service,
- the profitability or extent of any operating deficit that would be required over the next twenty years; and
- the cash flow over the next twenty years.

An evaluation of funding sources was also undertaken to identify the potential sources for constructing the stations, making the necessary track improvements, and procuring the rolling stock. Fare revenues were derived from the ridership estimates as described earlier. Three options, representing three different fare levels were analyzed. The first level, consistent with Phase 1, was to use an average fare of \$0.17 per mile. This fare level is lower than Amtrak's current fare structure, but is higher than that used by VRE, roughly \$0.10 per mile for discounted monthly pass fares from Fredericksburg to Washington, D.C. Ridership under Level 1 would grow from 390,300 in the base year to 808,900 in 2020. The associated fare revenue would increase from \$10.2 million in 1999 to \$25.8 million in 2020.

Level 2 fare revenues represent an average fare of \$0.30 per mile. This fare is nominally the current fare charged on Amtrak for inter-city travel (not long-distance). Projected ridership under Level 2

grows from 345,900 in the base year to 743,300 in 2020. The associated fare revenue increases from \$16.1 million in 1999 to \$34.4 million in 2020.

The previous levels are presented for comparison purposes and do not represent a recommendation. The likely fare would fall within this range. Thus, a third fare level, \$0.22 per mile, was analyzed. The ridership projections for Level 3 show growth from 372,100 in the base year to 782,100 in 2020. The revenue associated with this fare level would increase from \$12.6 million to \$29.3 million from 1999 to 2020.

The following table presents the detailed ridership, revenue and operating expense projections for the key analysis years for the fare level of \$0.22/mile.

**Table 13 - Detailed Ridership, Revenue and Operating Expense Projections:
Fare Level at \$0.22 per Mile**

Detail						
Revenue Miles	441,592					
Total Miles	471,600					
Gal./Mile (Fuel)	1.56					
Cost per Gallon (Fuel)	0.75					
		1999	2000	2005	2010	2020
Operating Revenues						
Ridership @ \$0.22 per mile	372,100	372,100	476,000	582,500	782,100	
Fare Revenue	12,610,000	12,610,000	16,933,000	21,289,000	29,276,000	
Ancillary Revenues @ 10% of Fare Revenue	1,261,000	1,261,000	1,693,300	2,128,900	2,927,600	
Subtotal Revenue	13,871,000	13,871,000	18,626,300	23,417,900	32,203,600	
Operating Expense						
Operations	4,628,160	4,628,160	4,628,160	4,628,160	4,628,160	
Station and Passenger Information	1,157,040	1,157,040	1,157,040	1,157,040	1,157,040	
Equipment Maintenance	4,650,000	4,650,000	4,650,000	4,650,000	4,650,000	
Energy	920,799	920,799	920,799	920,799	920,799	
Insurance	1,002,000	1,630,000	1,630,000	1,630,000	1,630,000	
Sales and Marketing	208,065	208,065	279,395	351,269	483,054	
Purchased Services	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	
Leases (excluding ROW rights)	325,000	325,000	325,000	325,000	325,000	
Equipment Leases	2,920,000	2,920,000	2,920,000	2,920,000	2,920,000	
ROW Access	5,502,000	5,502,000	5,502,000	5,502,000	5,502,000	
Subtotal Expense	22,713,064	23,341,064	23,412,394	23,484,268	23,616,053	
General and Administrative Support	1,317,358	1,353,782	1,357,919	1,362,088	1,369,731	
TOTAL Expense	24,030,422	24,694,846	24,770,312	24,846,355	24,985,784	

The following table presents the pro forma income statement schedule of revenues and expenditures for the key analysis years, including revenues, and operating and amortized capital expense. The operating expenses are based on the aforementioned costs and assumptions. Capital cost summaries are presented in the following table.

Table 14 - Fund Balance Schedule of Revenues and Expenditures at \$0.22/mile

	1999	2000	2005	2010	2,020
REVENUES					
General Fund- Operations	10,159,422	10,823,846	6,144,012	1,428,455	(7,217,816)
Operating Fare Revenue	12,610,000	12,610,000	16,933,000	21,289,000	29,276,000
Auxiliary Operating Revenue	1,261,000	1,261,000	1,693,300	2,128,900	2,927,600
<i>Subtotal Operations</i>	24,030,422	24,694,846	24,770,312	24,846,355	24,985,784
General Fund- Capital	8,242,700	-	-	-	-
Federal Intergovernmental- Capital	884,000	-	-	-	-
Local Government Intergovernmental- Capital	93,000	-	-	-	-
Private Participation Contributions- Capital	17,500	-	-	-	-
Subtotal Capital	9,237,200	-	-	-	-
Total Revenues	33,267,622	24,694,846	24,770,312	24,846,355	24,985,784
EXPENDITURES:					
Operating Expense (using \$.22 fare cost)	24,030,422	24,694,846	24,770,312	24,846,355	24,985,784
Capital Cost- Amortized	818,466	818,466	818,466	818,466	-
Subtotal Expense	24,848,888	25,513,312	25,588,778	25,664,821	24,985,784
Operating Revenue Recovery Ratio	58%	56%	75%	94%	129%

The details for amortized capital costs are presented in the following table. Structures are amortized over a period of 20 years. The equipment costs are presented for information purposes. The analysis includes the amortized lease cost for locomotive-hauled passenger cars compared to DMUs, for evaluation purposes. VDRPT may wish to purchase vehicles and amortize the value, taking advantage of federal and other funding sources.

Table 15 - Amortized Capital Costs

CAPITAL COSTS						
Siding Extensions	1,922,200					
Rural Retreat Siding	2,357,000					
Richmond Connection	3,500,000					
Storage Facilities	353,000					
Stations (Unmanned)	1,105,000					
Total (Except Equipment)	9,237,200					
Amortization Period	20					
Amortization Rate	6.20%					
Annual Cost	\$818,466					
Period	1	2	3	4	5	
Depreciation	655,841	609,276	566,018	525,831	488,497	
Salvage	1,000,000					
Number of Years	30					
Equipment Costs	DMU	F-40	Loco-Used			
Trainset (3 cars/set)	5,500,000	7,000,000	4,900,000			
4 Trainsets	22,000,000	28,000,000	19,600,000			
Amortization Period (years)	15	15	15			
Amortization Rate	6.20%	6.20%	6.20%			
Annual Cost	2,294,875	2,920,750	2,044,525			
Trainset (4 cars/set)	6,900,000	8,600,000	6,020,000			
4 Trainsets	27,600,000	34,400,000	24,080,000			
Amortization Period	15	15	15			
Amortization Rate	6.20%	6.20%	6.20%			
Annual Cost	2,879,025	3,588,350	2,511,845			

APPENDIX A- SUMMARY OF PUBLIC COMMENTS

A total of six Public Meetings were held to present the findings of Phase 2 of the Bristol Rail Passenger Study. The Table below shows the meeting locations and the number of people in attendance:

Date	Location	Total Attendance
January 20, 1998	Bristol	62
January 21, 1998	Roanoke	54
January 22, 1998	Lynchburg	25
February 19, 1998	Manassas	20
February 23, 1998	Richmond	14
February 24, 1998	Charlottesville	35
Total		210

A total of 74 written comments have been received concerning this study. These can be categorized as follows:

Category	Number
Norfolk Southern Corporation	1
Cities, Counties and Towns	9
Planning District Commissions	2
Universities	2
Civic Associations	3
Rail Advocacy Groups	2
Chambers of Commerce & Other Business Interests	7
Individuals	65
Total Written Comments	91

A letter from Mr. Bill Schafer, Director of Strategic Planning for Norfolk Southern Corporation, expressed the railroad's concerns about the proposed Bristol Rail Passenger Service. Concerns were expressed in four areas: 1) train operation simulations; 2) Freight train delays and capacity improvements; 3) passenger equipment; and 4) liability and compensation.

The large majority of the comments were very supportive of the proposal to offer rail passenger service to Central and Southwest Virginia. Many of the respondents had specific recommendations for changes and improvements to the study, and several of these have been incorporated into the final report. One person questioned the validity of ridership projections and suggested that travelers would be better served by "deluxe bus units on I-81." Several residents of the State of Tennessee (including the Mayor of Bristol, Tennessee) wrote to support the study, but they suggested that the service should continue beyond Bristol to Knoxville and Chattanooga. At least 10 written comments were received which voiced support for including a station in Orange. A letter from the Orange County chamber of Commerce was signed by 13 members of the Board of Directors, who in turn represent over 225 Orange County businesses. Based on the strong support voiced in the Public Participation process, a recommendation to include a station in Orange has been incorporated into the final report.

Of the comments received, 21 were submitted on the comment sheets distributed at the Public Meetings. Another 20 comments were received via electronic mail. One letter from the members of the Moribana Garden club in Wytheville included signatures of 15 people who support the proposed service. A representative sample of the comments is attached, including copies of all of the formal resolutions, letters from business interests, and many of the individual statements. A file of all of the comments received is being maintained at the Department of Rail and Public Transportation, and is available for public review.